APPLICATION

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TITLE: AGGREGATING WEB DATA ON CLIENTS AND
DISTRIBUTING THE AGGREGATED DATA TO
WIRELESS HANDHELD DEVICES

INVENTORS: MURTHI NANJA

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AGGREGATING WEB DATA ON CLIENTS AND DISTRIBUTING THE AGGREGATED DATA TO WIRELESS HANDHELD DEVICES

Background

This invention relates in general to aggregation and

5   distribution of web data.

Anyone with an Internet connection can access up-to-
date information for stocks, news, sports, weather, etc.
from millions of web sites. The information can be static
information such as company product brochures or dynamic

10 information such as stock quotes and weather. Today
Internet users worldwide access information through their
desktop personal computers, for example, using either their
dial-up modem connections at home or their local area
network connections at work.

15 Typically, information downloaded from a web site to a
web browser is in HyperText Markup Language (HTML). When a
user accesses a web site, the web browser first downloads
the HTML contents to the user's local system, then
processes the downloaded HTML document, and finally

20 displays the web content to the user. In addition to the
web browser, any other applications running on the local
system can process and display HTML pages. Common Gateway
Interface (CGI) scripts and middleware components running
on the web server are commonly used to generate either

25 static or dynamic HTML content. Users may access web

content via wireless handheld devices such as Personal Digital Assistants (PDAs), web tablets, and cellular telephones as well as desktop or laptop computers.

Many wireless operators are currently providing
5   wireless Internet access for handheld devices through second-generation (2G) cellular networks such as GSM (Global System for Mobile Communication), IS-95 CDMA (Code Division Multiple Access), IS-136 TDMA (Time Division Multiple Access), and PDC (Packetized Digital Cellular).
10 These 2G cellular wireless networks provide data rates between 9.6 Kbps and 14.4 Kbps. Most of these 2G cellular technologies are based on circuit-switched operations.

Since the wireless handheld device subscribers are charged on the basis of connection time, wireless data
15 services are expensive when compared to those of similar wireline Internet access services. Because of the costs involved, many handheld device owners are reluctant to use wireless Internet access, and only use their handheld device to synchronize Personal Information Management (PIM)
20 software.

Wireless handheld device users may access information from individual web sites by accessing target Uniform Resource Locators (URLs) directly from their wireless handheld units connected to the Internet via a cellular
25 network. Alternatively, users may access target URLs indirectly by synchronizing their device with their desktop

system which acts as a proxy for the target URLs. In the
second method, the desktop system can cache all predefined
web pages for the handheld unit. Each time the user wants
to access information from a different web page, a new

5   session may be established, incurring increasing cellular
charges.

Thus, there is a need for better ways to access
information on the Internet using wireless devices.

Brief Description of the Drawings

10   Figure 1 is a block diagram of a web data aggregation
and distribution system in accordance with one embodiment
of the present invention;

Figure 2 depicts software components used in the data
aggregation and distribution system in accordance with one

15   embodiment of the present invention;

Figure 3 depicts the data aggregation method employed
by the data aggregator application in accordance with one
embodiment of the present invention; and

Figure 4 is a flow chart for software in accordance

20   with one embodiment of the present invention.

Detailed Description

The data aggregation and distribution system 100,
shown in Figure 1, includes wireless units 101, processor-
based system 103, Internet 104, and web servers 105. Buses

25   108 and 110 may be serial ports or Universal Serial Bus

(USB) based cable or wireless interfaces between the wireless units 101, and the system 103, respectively. Hypertext Transfer protocol (HTTP) 112 and 114 are the protocol interfaces between the system 103 and the web

5   servers 105, respectively. In the illustrated embodiment, three sample web servers, 105a, b and c (i.e., weather, stock quote and news) are depicted, but the nature of the information from the web servers can be anything relevant to mobile users (e.g., product price quotes and product

10   inventory level from suppliers).

Wireless interfaces 110, such as Bluetooth wireless interfaces, may be located between the wireless units 101 and the system 103. The Internet 104 couples the system 103 and the web servers 105. The Bluetooth wireless

15   interface is a short-range (within 10 meters) radio communication technology developed specifically as a cable replacement solution for desktop systems with standard peripherals such as keyboards, mice, printers, and digital cameras. In addition, Bluetooth has capabilities to set up

20   point-to-point or point-to-multipoint ad hoc networks among many Bluetooth devices (e.g., desktop systems and PDAs).

The wireless units 101 can be handheld, mobile devices in one embodiment, such as PDAs, cellular telephones, or web tablets, or they may be other processor-based non-

25   handheld, non-mobile devices. Each wireless unit 101 has cellular wireless connectivity and a HTML web browser. The

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system 103, acting as an intermediary or as an "information hub" for the wireless unit 101, provides aggregated web information to each wireless unit 101. The system 103 may be any processor-based system including a desktop computer or processor-based appliance, as two examples. The system 103 may include a processor 113 and storage 115 coupled to the processor 113. The web servers 105 act as information sources for the system 103. In one embodiment, no modifications or additional components, either hardware or software, may be needed on any of the components depicted in Figure 1 other than the system 103.

As shown in Figure 2, a web data aggregator application 207, running on the system 103, performs integration or aggregation of various types of information relevant to each unit 101 user. The web aggregator application 207 is responsible for interacting with a web server 105, extracting desired information such as weather, stock quotes and news, and then aggregating this information in a manner that is meaningful to users of the wireless units 101. The applications 207-209 and the content 210 may be stored in the storage 115.

The web server 105 processes the HTTP requests 112/114 received from the system 103 using CGI scripts 211 and then sends a response as a HTTP response 114/112 to the system 103. The CGI scripts 211 access the target web content 213 directly or through middleware software component 212 and

generate data, for example, in eXtensible Markup Language
(XML) format in one embodiment. As an example, stock
portfolio data gathered on the web server 105 in XML format
may include information such as ticker, time, last price,

5   open price, day's high, day's low, volume and average
volume.

The web data aggregator application 207 gathers data
(such as a stock portfolio) for various kinds of
information in one embodiment. The web data aggregator

10   application 207 may use Application Programming Interfaces
(APIs) published by the web content vendors for their
services in one embodiment. Using the APIs may reduce the
need to retrieve HTML documents from the web server 105,
parsing them to obtain user requested web data, and making

15   the requested data available for aggregation. In addition,
in one embodiment, the data aggregator application 207 may
be unaltered, even if the format of the target web server
105 content is changed by the content vendor. Once the web
data aggregator application 207 completes the task of

20   gathering data from various web servers 105, in one
embodiment, it may process the data using one or more XML
Stylesheet Languages (XSL) to generate the aggregated
content 210.

A data synchronizer application 208 running on the

25   system 103 transfers the aggregated content 210 to a
wireless unit 101. Data synchronization can be triggered

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by connecting a wireless unit 101 to the system 103 via interfaces 108/110. Alternatively, synchronization may be triggered by explicitly invoking a special command in the data synchronizer application 208, if the wireless handheld

5   unit 101 is already connected to the system 103. By default, the data synchronizer application 208 transfers the aggregated content 210 to the wireless handheld unit 101 whenever there is a new information in the aggregated content 210. The user may configure the data synchronizer

10   application 208 to modify the default data synchronization behavior.

A data aggregator configuration utility 209 running on the system 103 changes the data aggregator application's 207 behavior. By default, the data aggregator application

15   207 may attempt to gather web data at a predetermined time of the day set by the user. However, this can be changed by the data aggregator configuration utility 209, under the direct control of the user, to gather data whenever the system 103 is in idle state or based on some other user-

20   specified criteria.

The data aggregator application 207, data aggregator configuration utility 209, and the data synchronizer application 208 may be combined into a single executable application on the system 103. In an embodiment in which

25   the web data aggregator application 207 also includes the functions of the application 208 and utility 209, the

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application 207 receives and stores user web data requests as indicated in block 402 of Figure 4. Upon the occurrence of an appropriate event, such as a period of low activity on the system 103, as indicated in diamond 404, the

5   requested web data is automatically accessed over the Internet as indicated in block 406. The accessed web data is then stored as indicated in block 408.

Upon the occurrence of a predetermined event, such as a predetermined time or a user request from a wireless unit

10   101, as indicated in block 410, the accumulated web data is transferred from the system 103 to the unit 101 as indicated in block 412.

The wireless unit 101 has an Internet web browser 205 that is capable of displaying standard Internet content

15   formats such as HTML and XML. The web browser 205 running on the wireless unit 101 may be used to browse the aggregated content 206 downloaded to the wireless unit 101.

In one embodiment, the data aggregation method 301 takes XML data files 302, 303 and 304 generated from their

20   respective web servers 105 and one or more XSL stylesheets 305, 306 and 307 for each type of web data information, as shown in Figure 3. An XSL stylesheet describes how the XML source content should be styled, laid out and paginated onto a web browser 205 running on the wireless unit 101.

25   The data aggregation method 301 may accept both XML and XSL documents. The method may accept both XML and XSL

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for the handheld units 101 as aggregated data in HTML or extensible HTML (XHTML) format. The data aggregation method 301 can generate aggregated content in formats other than the default HTML or XHTML format by simply adding

5   additional stylesheets.

The aggregated data in HTML format 308 may be represented as a single HTML file or a group of hyperlinked HTML files as two examples. Typically these files may be located in a single directory on the system 103 so that the

10   data synchronizer application 208 can easily transfer them to the user's wireless unit 101.

The following example illustrates one embodiment of the application of the principles described herein.

1.   A mobile user, who owns a system 103 at his/her

15   office and a wireless unit 101, walks into his/her office at 8:00 in the morning, plugs in the unit 101 into a cradle that is attached to the system 103, and then powers up the system 103.

2.   During the system boot-up sequence, the system

20   103 automatically runs the data aggregator application 207, the data synchronizer application 208, and the data aggregator configuration utility 209. These software components are configured during set up to automatically launch immediately after the system power-up.

25   3.   The standard synchronizer agent for the unit 101 automatically transfers the mobile user's calendar, e-

mails, contact information, and other related information to the handheld unit 101 so that this information is readily available to the mobile user when he/she is temporarily away from the office.

5   4.   The mobile user performs routine tasks such as reading or sending e-mails, accessing Internet or intranet web sites, developing code, writing documents, and so on.

5.   At the end of the day, around 5:30, the data aggregator application 207 automatically initiates the
10   aggregation process and generates new aggregated content from various predefined web servers. This data aggregation activity is transparent to the mobile user.

6.   Through the data synchronizer application 207, the mobile user transfers the new aggregated content to
15   his/her wireless unit 101 before leaving the office for the day.

7.   The mobile user leaves the office with his/her unit 101.

8.   The mobile user browses the aggregated content
20   using the web browser 205 at home.

Although the above usage scenario is intended for a corporate mobile user, the present invention is not so limited. The underlying principles can be easily applied to aggregate and distribute data in a consumer home
25   environment or any other scenario.

Many existing wireless data services that are based on second generation (2G) wireless technologies are expensive when compared to those of similar wireline Internet data services. As a result, many mobile handheld device owners may prefer to view the aggregated data in offline mode rather than directly connecting to the Internet. In some embodiments of the present invention, a mechanism addresses this user preference issue. Some embodiments may provide a way to aggregate data on a user's local system 103 and then display the data on one or more units 101.

Some embodiments may have advantages over aggregating data on the web server 105, including reducing the wireless unit 101 owner's Internet connection time charges as information is aggregated and distributed using his/her system 103, providing opportunities for customizing aggregated data based on the wireless unit 101 owner's preferences, and providing a default view of the aggregated data to the unit 101 owner, if required. Aggregation of data from various web sites on a system 103, for example, may provide a unified view of information to the unit 101 owner and thereby increase his/her productivity. A wireless unit 101 owner may determine when to aggregate and distribute relevant web data on his/her system 103.

In some implementations, no changes or modifications may be needed to the wireless units 101 and no special software or hardware component needs to be installed on

wireless units 101. Instead, the system 103 may alone accomplish the aggregation in one embodiment.

In one embodiment, data may be aggregated whenever the system 103 is in an idle state. In addition, the local
5 user can configure the system 103 to aggregate data at a predetermined time of the day using a configuration utility 209.

While the present invention has been described with respect to a limited number of embodiments, those skilled
10 in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall within the true spirit and scope of this present invention.

What is claimed is: